CHAPTER 4: – WATER QUALITY ASSESSMENT

Introduction

This chapter contains a summary of the quality of raw and treated water in the Hodges Watershed during the period of January 1, 2001, through December 31, 2005. Following the summary there is a discussion of the reservoir and its possible future use.

The Water Quality Laboratory of the City of San Diego provided monitoring data from Hodges Reservoir and the Hodges Watershed.

Summary Of Monitoring Program

Hodges Reservoir was sampled near the outlet structure at surface level and at sampling points within the watershed. See Table 5-4.1 for a summary of the sampling frequency. The watershed sample results are summarized in Table 5-4.2, and a summary of raw water quality at the reservoir surface is found in Table 5-4.3.

Description Of Water Quality At Watershed Sampling Points

Nine sample points were chosen to present, based on the amount of data available. Those having fewer than five data points were deemed to be unrepresentative of a five year period. The Cedar and Paradise Fires of October 2003 and the extremely wet winter the following year prompted increased monitoring of the watershed. Samples were analyzed for conductivity and total dissolved solids, as well as a complete panel of trace metals, nutrients, and organic constituents. Microbiological parameters were not monitored.

The Drinking Water Standards used in Table 5-4.2 apply to treated, potable water, and are for reference only.

General Physical

Conductivity and Total Dissolved Solids were monitored. In both cases, the upper SMCL was exceeded. This is to be expected due to the turbid nature of the samples.

Inorganic Constituents

Trace metals were filtered before analysis and reported as dissolved trace metals. Maximum values aluminum and manganese exceeded the MCL. Average value of aluminum was 57.8 ug/L. The average value of manganese was 135 ug/L. Nutrient loading was a concern during and after the rainy season of 2004-2005. Nutrient levels increased after the Cedar fire. Monitoring for Total Nitrogen began in January of 2003.

Organic Constituents

The full range of organic herbicides, pesticides, and other contaminants was monitored. None were detected at the DLR.

Description of Source Surface Water Quality

Hodges Reservoir at Surface -

Table 5-4.3 contains a summary of water quality data for Hodges Reservoir at the surface. The reservoir was monitored for general physical characteristics, organic and inorganic constituents, and microorganisms.

General Physical

The monitored physical parameters of Hodges Reservoir at surface met drinking water MCLs except maximum values for color, TDS, and turbidity. Since the reservoir contains raw water, and the standards are for treated, the comparison is for reference only. Color, TDS and turbidity were elevated after rain events and decreased significantly during periods of dry weather. Threshold odor was not monitored at surface level.

Microbiological

Total coliform, E. Coli, and Enterococcus were monitored in order to obtain a background representation of microbiological conditions. Total coliforms ranged from 99 /100ml to > 24,000 /100ml. The E. Coli range was from <10 /100ml to 55 /100ml, and Enterococcus varied from <1 /100ml to 26 /100ml. Cryptosporidium and Giardia were not monitored in the reservoir.

Inorganic Constituents

There were twenty-eight inorganic constituents measured. Maximum values for Aluminum, Iron, and Manganese exceeded the secondary maximum contaminant levels. Nutrients, while high in the watershed samples, were within limits in the reservoir.

Organic Constituents

The full range of organic herbicides, pesticides, and other contaminants was monitored. Methyl t-Butyl Ether(MTBE) was detected with a maximum of 9.21ug/L and an average of <DLR. MTBE has decreased in the reservoir do to two factors. First MTBE has been removed from gasoline. Second 2-stroke motors have been replaced with 4-stroke motors in the rental fleet. Toluene had one sample > DLR with a value of 0.557 ug/L.

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Evaluation of Source Water Quality

Hodges Reservoir water has a high mineral content, color, turbidity, total hardness, TOC and alkalinity. The high TOC makes Hodges reservoir water difficult to treat using free chlorine and chloramines as disinfectants. Alternative disinfection, such as using ozone for primary disinfection may be necessary to meet TTHM MCL limits.

Hodges Reservoir supplies the Badger WTP, which is owned and operated by the San Dieguito Water District. Hodges Reservoir does not supply water to the City of San Diego at this time. Future plan include potential CIP projects to allow Miramar Reservoir to receive water from Hodges Reservoir.

Table 5-4.1
RAW WATER QUALITY MONITORING PROGRAM
HODGES RESERVOIR ,
2001 THROUGH 2005

Parameters	Planned Sampling Frequency[1]
General Physical	
Alkalinity	Q
Color	Q
Conductivity	Q
Corrosivity	Q
Hardness as $CaCO_3$	Q
pH	Q
Total Dissolved Solids	Q
Turbidity	Q
Microbiological	
Total Coliform	M
E. Coli	M
Enterococcus	M
Radiological	
Gross Alpha particles	(2)
Gross Beta particles	(2)
Combined Radium-226 &	(2)
Strontium-90	(2)
Tritium	(2)
Uranium	(2)
Inorganic Constituents	
Aluminum	Q
Antimony	Q
Arsenic	Q
Barium	Q
Beryllium	Q
Cadmium	Q
Calcium	Q
Chloride	Q
Chromium	Q
Copper	Q
Cyanide	Q
Fluoride	Q
Iron	Q
Lead	Q

Table 5-4.1 RAW WATER QUALITY MONITORING PROGRAM HODGES RESERVOIR , 2001 THROUGH 2005	
Parameters	**Planned Sampling Frequency[1]**
Magnesium	Q
Manganese	Q
Mercury	Q
Nickel	Q
Nitrate**	Q
Nitrate + Nitrite**	Q
Nitrite as Nitrogen	Q
Phosphate (ortho)**	Q
Phosphorus (total)**	Q
Potassium	Q
Selenium	Q
Silver	Q
Sulfate	Q
Thallium	Q
Zinc	Q
Perchlorate	Q
Organic Constituents, Regulated	
1,1,1-Trichloroethane	Q
1,1,2-Trichloro-	Q
1,1,2-Trichloroethane	Q
1,1-dichloroethane	Q
1,1-Dichloroethylene	Q
1,2,4-Trichlorobenzene	Q
1,2-dichloroethane	Q
1,2-Dichloropropane	Q
1,4-Dichlorobenzene	Q
2,4,5 TP	Q
2,4-D	Q
Alachlor	Q
Atrazine	Q
Bentazon	Q
Benzene	Q
Benzo(a)pyrene	Q
Bromodichloromethane	Q
Bromoform	Q
Carbofuran	Q
Chloramine	Q

Table 5-4.1 RAW WATER QUALITY MONITORING PROGRAM HODGES RESERVOIR , 2001 THROUGH 2005	
Parameters	**Planned Sampling Frequency[1]**
Chlordane	Q
Chlorine	Q
Chlorine Dioxide	Q
Chloroform	Q
cis-1,2-Dichloroethylene	Q
Dalapon	Q
Di(2-ethylhexyl) adipate	Q
Di(2-ethylhexyl) pthalate	Q
Dibromochloromethane	Q
Dibromochloropropane	Q
Dichloromethane	Q
Dinoseb	Q
Diquat	Q
Endrin	Q
Ethylbenzene	Q
Glyphosate	Q
Heptachlor	Q
Heptachlor epoxide	Q
Hexachlorobenzene	Q
Hexachlorocyclopentadiene	Q
Lindane	Q
Methoxychlor	Q
Methyl tert-Butyl Ether (MTBE)	Q
Molinate	Q
Monochlorobenzene	Q
o-Dichlorobenzene	Q
Oxamyl	Q
Pentachlorophenol	Q
Picloram	Q
Polychlorinated biphenyls	Q
Simazine	Q
Styrene	Q
Tetrachloroethylene	Q
Thiobencarb	Q
Toluene	Q
Total Organic Carbon (TOC)	Q
Toxaphene	Q
trans-1,2-Dichloroethylene	Q
Trichloroethylene	Q

Table 5-4.1
RAW WATER QUALITY MONITORING PROGRAM
HODGES RESERVOIR ,
2001 THROUGH 2005

Parameters	Planned Sampling Frequency[1]
Trichlorofluoromethane	Q
Vinyl chloride	Q
Xylenes	Q
Organic Constituents, Unregulated	
Ethyl-tert-Butyl Ether (ETBE)	M
t-Amyl-methyl ether (TAME)	M
1,1,1,2-Tetrachloroethane	M
1,1-Dichloropropene	M
1,2,3-Trichlorobenzene	NS
1,2,3-Trichloropropane (TCP)	A[3]
1,2,4-Trimethylbenzene	Q
1,3,5-Trimethylbenzene	Q
1,3-Dichlorobenzene	Q
1,3-Dichloropropane	Q
2,2-Dichloropropane	Q
3-Hydroxycarbofuran	Q
Aldicarb	Q
Aldicarb sulfone	Q
Aldicarb sulfoxide	Q
Aldrin	Q
Bromacil	A
Bromobenzene	Q
Bromochloromethane	Q
Bromomethane	Q
Butachlor	A
Carbaryl	Q
Chlorobenzene	Q
Chloroethane	Q
Chloromethane	Q
Dibromomethane	Q
Dicamba	Q
Dichlorodifluoromethane	Q
Dieldrin	Q
Geosmin**	Q
Hexachlorobutadiene	Q
Isopropylbenzene	Q
Methomyl	Q
Methyl-isoborneol (MIB)**	Q

Table 5-4.1
RAW WATER QUALITY MONITORING PROGRAM
HODGES RESERVOIR ,
2001 THROUGH 2005

Parameters	Planned Sampling Frequency[1]
Metolachlor	A
Metribuzin	A
Napthalene	Q
n-Butylbenzene	Q
n-Propylbenzene	Q
Prometryn	A
Propachlor	Q
sec-Butylbenzene	Q
tert-Butylbenzene	Q

SAMPLING FREQUENCY DESIGNATION
D: Daily
W: Weekly
M: Monthly
Q: Quarterly
A: Annually
NS: Not Sampled

(1) Samples may be taken but not reportable due to instrumentation problems or quality control.
(2) Sample frequency is every four years. The data used in this report was obtained during 2002.
(3) Samples taken twice per month (M^3), twice per week (W^3), or twice annually (A^3).

NOTE:
** Denotes the start of a new parameter since the 2000 Sanitary Survey was completed. Sampling frequency represents current monitoring schedule as of January 2001.

Table 5-4.2
SUMMARY OF RAW WATER QUALITY**
HODGES WATERSHED[1] 2001 - 2005

Parameters	Units	DLR*/ MDL	Drinking Water Standards[2] MCL	SMCL	No. of Samples	Raw Water quality MIN	MAX	MEAN	MEDIAN
General Physical									
Conductivity	µS/cm			900-1600	249	150	3170	1846	2140
Total Dissolved Solids	mg/L	10		500-1000	393	36.0	6360	1261	1420
Inorganic Constituents[3]									
Aluminum	µg/L	50	1000	200	21	nd	360	57.8	nd
Antimony	µg/L	6	6		26	nd	nd	nd	nd
Arsenic	µg/L	2	10		26	nd	3.00	nd	nd
Barium	µg/L	100	1000		13	nd	188	nd	nd
Beryllium	µg/L	1	4		15	nd	nd	nd	nd
Cadmium	µg/L	1	5		26	nd	1.12	nd	nd
Chromium	µg/L	10	50		21	nd	nd	nd	nd
Copper	µg/L	50	1300	1000	26	nd	62.4	nd	nd
Lead	µg/L	5	15 AL		26	nd	2.75	nd	nd
Manganese	µg/L	20		50	23	nd	570	135	52.5
Nickel	µg/L	10	100		23	nd	nd	nd	nd
Selenium	µg/L	5	50		24	nd	nd	nd	nd
Silver	µg/L	10		100	1	nd	nd	nd	nd
Thallium	µg/L	1	2		26	nd	nd	nd	nd
Zinc	µg/L	50		5000	13	nd	53.2	nd	nd
Nitrate + Nitrite	mg/L		10		149	nd	30.7	8.03	6.35
Total Nitrogen	mg/L	0.4	1		219	nd	8.55	2.38	2.35
Phosphorus	mg/L	0.0781			358	nd	3.38	0.17	0.14
Phosphate (ortho)	mg/L	0.2			364	nd	3.38	nd	nd
Organic Constituents, Regulated									
1,1,1-Trichloroethane	µg/L	0.5	200		101	nd	nd	nd	nd
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	10	1200		101	nd	nd	nd	nd
1,1,2-Trichloroethane	µg/L	0.5	5		101	nd	nd	nd	nd
1,1-Dichloroethane	µg/L	0.5	5		101	nd	nd	nd	nd
1,1-Dichloroethylene	µg/L	0.5	6		101	nd	nd	nd	nd
1,2,4-Trichlorobenzene	µg/L	0.5	70		101	nd	nd	nd	nd
1,2-Dichloroethane	µg/L	0.5	.5		101	nd	nd	nd	nd
1,2-Dichloropropane	µg/L	0.5	5		101	nd	nd	nd	nd
1,4-Dichlorobenzene	µg/L	0.5	5		101	nd	nd	nd	nd
Alachlor	µg/L	1	2		70	nd	nd	nd	nd
Atrazine	µg/L	1	3		71	nd	nd	nd	nd
Benzene	µg/L	0.5	1		101	nd	nd	nd	nd
Benzopyrene	µg/L	0.1	.2		63	nd	nd	nd	nd
Bromodichloromethane	µg/L	0.5			101	nd	nd	nd	nd
Bromoform	µg/L	0.5			101	nd	nd	nd	nd
Carbofuran	µg/L	5	18		79	nd	nd	nd	nd
Chlordane	µg/L	0.1	.1		78	nd	nd	nd	nd
Chloroform	µg/L	0.5			101	nd	nd	nd	nd
cis-1,2-Dichloroethylene	µg/L	0.5	6		101	nd	nd	nd	nd
Di(2-ethylhexyl) adipate	µg/L	5	400		70	nd	nd	nd	nd
Di(2-ethylhexyl) pthalate	µg/L	3	4		65	nd	nd	nd	nd
Dichloromethane (methylene chloride)	µg/L	0.1	5		101	nd	nd	nd	nd
Endrin	µg/L	0.1	2		93	nd	nd	nd	nd
Ethylbenzene	µg/L	0.5	700		101	nd	nd	nd	nd
Heptachlor	µg/L	0.01	.01		86	nd	nd	nd	nd
Heptachlor epoxide	µg/L	0.01	.01		87	nd	nd	nd	nd
Hexachlorobenzene	µg/L	0.05	1		94	nd	nd	nd	nd
Hexachlorocyclopentadiene	µg/L	1	50		93	nd	nd	nd	nd
Lindane	µg/L	0.2	.2		81	nd	nd	nd	nd
Methoxychlor	µg/L	10	40		91	nd	nd	nd	nd

Table 5-4.2
SUMMARY OF RAW WATER QUALITY**
HODGES WATERSHED[1] 2001 - 2005

Parameters	Units	DLR*/ MDL	Drinking Water Standards[2] MCL	SMCL	No. of Samples	Raw Water quality MIN	MAX	MEAN	MEDIAN
Methyl tert-Butyl Ether (MTBE)	µg/L	3	13	5	101	nd	nd	nd	nd
Molinate	µg/L	2	20		14	nd	nd	nd	nd
Monochlorobenzene	µg/L	0.5	70		101	nd	nd	nd	nd
Oxamyl	µg/L	20	200		79	nd	nd	nd	nd
Polychlorinated biphenyls (PCBs)	µg/L	0.5	.5		56	nd	nd	nd	nd
Simazine	µg/L	1	4		49	nd	nd	nd	nd
Styrene	µg/L	0.5	100		101	nd	10	nd	nd
Tetrachloroethylene	µg/L	0.5	5		101	nd	nd	nd	nd
Toluene	µg/L	0.5	150		101	nd	nd	nd	nd
Total Organic Carbon (TOC)	mg/L	0.5			174	2.56	13.9	6.41	6.09
Toxaphene	µg/L	1	3		82	nd	nd	nd	nd
Trichloroethylene	µg/L	0.5	5		101	nd	nd	nd	nd
Trichlorofluoromethane	µg/L	5	150		101	nd	nd	nd	nd
Vinyl chloride	µg/L	0.5	.5		101	nd	nd	nd	nd
Organic Constituents, Unregulated									
Ethyl-t-Butyl Ether (ETBE)	µg/L	0.3			101	nd	nd	nd	nd
t-Amyl-methyl ether (TAME)	µg/L	0.2			101	nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	µg/L	0.5			101	nd	nd	nd	nd
1,1-Dichloropropene	µg/L	0.5			101	nd	nd	nd	nd
1,2,3-Trichlorobenzene	µg/L	0.5			101	nd	nd	nd	nd
1,2,3-Trichloropropane (TCP)	µg/L	0.5			81	nd	nd	nd	nd
1,2,4-Trimethylbenzene	µg/L	0.2			101	nd	nd	nd	nd
1,3,5-Trimethylbenzene	µg/L	0.2			101	nd	nd	nd	nd
1,3-Dichlorobenzene	µg/L	0.5			101	nd	nd	nd	nd
1,3-Dichloropropane	µg/L	0.5			101	nd	nd	nd	nd
2,2-Dichloropropane	µg/L	0.5			101	nd	nd	nd	nd
3-Hydroxycarbofuran	µg/L	3			79	nd	nd	nd	nd
Aldicarb	µg/L	3			79	nd	nd	nd	nd
Aldicarb sulfone	µg/L	4			79	nd	nd	nd	nd
Aldicarb sulfoxide	µg/L	3			76	nd	nd	nd	nd
Aldrin	µg/L	0.075			87	nd	nd	nd	nd
Bromobenzene	µg/L	0.5			101	nd	nd	nd	nd
Bromochloromethane	µg/L	0.5			101	nd	nd	nd	nd
Bromomethane	µg/L	0.5			101	nd	nd	nd	nd
Carbaryl	µg/L	5			79	nd	nd	nd	nd
Chlorobenzene	µg/L	0.5			101	nd	nd	nd	nd
Chloroethane	µg/L	0.5			101	nd	nd	nd	nd
Chloromethane	µg/L	0.5			101	nd	nd	nd	nd
Dibromomethane	µg/L	0.5			101	nd	nd	nd	nd
Dichlorodifluoromethane	µg/L	1			101	nd	nd	nd	nd
Dieldrin	µg/L	0.02			101	nd	nd	nd	nd
Hexachlorobutadiene	µg/L	0.5			101	nd	nd	nd	nd
Isopropylbenzene	µg/L	0.5			101	nd	nd	nd	nd
Methomyl	µg/L	2			79	nd	nd	nd	nd
Napthalene	µg/L	0.5			102	nd	nd	nd	nd
n-Butylbenzene	µg/L	0.5			101	nd	nd	nd	nd
tert-Butylbenzene	mg/L	0.5			101	nd	nd	nd	nd

Table 5-4.2
SUMMARY OF RAW WATER QUALITY**
HODGES WATERSHED[1] 2001 - 2005

Parameters	Units	DLR*/ MDL	Drinking Water Standards[2] MCL	SMCL	No. of Samples	Raw Water quality MIN	MAX	MEAN	MEDIAN

NOTES:

* The State of California DLR values are used when available. Parameters without DLR values were reported as MDL levels.

** The acceptance criteria in this table apply to finished, potable water, and are for reference only.

(1) The sampling points summarized are: CDC4, DDC3, FEL3, GVC2, KCC3, MON2, SYC2, TEM1, AND WCH1.

(2) State MCL and MCLG values may be more stringent then federal standards for treated water.

(3) Trace metal samples were filtered before analysis. The results reflect dissolved trace metals.

nd: non-detected at State of California DLR

nd: non-detected at State DLR or MDL if DLR not Available

Table 5-4.3
SUMMARY OF RAW WATER QUALITY**
HODGES RESERVOIR @ SURFACE 2001 - 2005

Parameters	Units	DLR*/ MDL	Drinking Water Standards[1] MCL	SMCL	No. of Samples	Raw Water quality MIN	MAX	MEAN	MEDIAN
General Physical									
Alkalinity	mg/L	2			19	128	241	194	192
Color	cu	1		15	17	3	110	50.3	44
Conductivity	µS/cm			900-1600	18	1200	2350	1856	1945
Corrosivity[3]	--			non-corrosive	16	0.13	1.54	1.1	1.22
Hardness as $CaCO_3$	mg/L	2			19	223	664	446	451
pH	units			6.5-8.5	17	7.69	8.83	8.31	8.35
Total Dissolved Solids	mg/L	10		500-1000	18	507	1490	1044	1055
Turbidity[2]	NTU	0.07	0.5	5	18	0.270	70.5	9.86	7.21
Microbiological									
Total Coliform	/100ml	10	(4)		68	99	>24000	9279	5950
E. Coli	/100ml	1			68	<10	55	4.7	<10
Enterococcus	/100ml	10			68	<1	26	5.30	3.1
Inorganic Constituents									
Aluminum	µg/L	50	1000	200	17	nd	413	115	94.2
Antimony	µg/L	6	6		17	nd	nd	nd	nd
Arsenic	µg/L	2	10		17	nd	4.09	nd	2.08
Barium	µg/L	100	1000		17	nd	200	nd	nd
Beryllium	µg/L	1	4		17	nd	nd	nd	nd
Cadmium	µg/L	1	5		17	nd	nd	nd	nd
Calcium	mg/L	5			18	48.0	192	104	95.0
Chloride	mg/L	6.5		250-500	16	92.2	306	208	224
Chromium	µg/L	10	50		17	nd	nd	nd	nd
Copper	µg/L	50	1300	1000	17	nd	nd	nd	nd
Cyanide	µg/L	100	200		12	nd	nd	nd	nd
Fluoride	mg/L	0.1	2		18	0.213	0.377	0.309	0.314
Iron	µg/L	100		300	17	nd	557	253	214
Lead	µg/L	5	15		17	nd	nd	nd	nd
Magnesium	mg/L	3			18	13.2	91.2	45.2	45.0
Manganese	µg/L	20		50	17	53.9	1420	389	226
Mercury	µg/L	1	2		16	nd	nd	nd	nd
Nickel	µg/L	10	100		17	nd	nd	nd	nd
Nitrate	mg/L	2	45		41	nd	5.53	nd	nd
Nitrate + Nitrite	mg/L		10		15	0.062	1.98	0.995	1.24
Nitrite as Nitrogen	mg/L	0.4	1		25	nd	nd	nd	nd
Potassium	mg/L	0.5			17	5.61	13.1	7.78	7.72
Selenium	µg/L	5	50		17	nd	nd	nd	nd
Silver	µg/L	10		100	17	nd	nd	nd	nd
Sulfate	mg/L	6.25		250-500	16	112	474	292	272
Thallium	µg/L	1	2		17	nd	nd	nd	nd
Zinc	µg/L	50		5000	17	nd	nd	nd	nd
Perchlorate	µg/L	5			23	nd	nd	nd	nd

Table 5-4.3
SUMMARY OF RAW WATER QUALITY**
HODGES RESERVOIR @ SURFACE 2001 - 2005

Parameters	Units	DLR*/ MDL	Drinking Water Standards[1] MCL	SMCL	No. of Samples	Raw Water quality MIN	MAX	MEAN	MEDIAN
Organic Constituents, Regulated									
1,1,1-Trichloroethane	µg/L	0.5	200		22	nd	nd	nd	nd
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	10	1200		22	nd	nd	nd	nd
1,1,2-Trichloroethane	µg/L	0.5	5		22	nd	nd	nd	nd
1,1-Dichloroethane	µg/L	0.5	5		22	nd	nd	nd	nd
1,1-Dichloroethylene	µg/L	0.5	6		22	nd	nd	nd	nd
1,2,4-Trichlorobenzene	µg/L	0.5	70		22	nd	nd	nd	nd
1,2-Dichloroethane	µg/L	0.5	.5		22	nd	nd	nd	nd
1,2-Dichloropropane	µg/L	0.5	5		22	nd	nd	nd	nd
1,4-Dichlorobenzene	µg/L	0.5	5		22	nd	nd	nd	nd
2,4,5 TP	µg/L	1	50		17	nd	nd	nd	nd
2,4-D	µg/L	10	70		17	nd	nd	nd	nd
Alachlor	µg/L	1	2		19	nd	nd	nd	nd
Atrazine	µg/L	1	3		20	nd	nd	nd	nd
Bentazon	µg/L	2	18		16	nd	nd	nd	nd
Benzene	µg/L	0.5	1		22	nd	nd	nd	nd
Benzopyrene	µg/L	0.1	.2		13	nd	nd	nd	nd
Bromodichloromethane	µg/L	0.5			22	nd	nd	nd	nd
Bromoform	µg/L	0.5			22	nd	nd	nd	nd
Carbofuran	µg/L	5	18		15	nd	nd	nd	nd
Chlordane	µg/L	0.1	.1		19	nd	nd	nd	nd
Chloroform	µg/L	0.5			22	nd	nd	nd	nd
cis-1,2-Dichloroethylene	µg/L	0.5	6		22	nd	nd	nd	nd
Di(2-ethylhexyl) adipate	µg/L	5	400		12	nd	nd	nd	nd
Di(2-ethylhexyl) pthalate	µg/L	3	4		14	nd	nd	nd	nd
Dichloromethane (methylene chloride)	µg/L	0.1	5		22	nd	nd	nd	nd
Dinoseb	µg/L	0.5	7		16	nd	nd	nd	nd
Endrin	µg/L	0.1	2		31	nd	nd	nd	nd
Ethylbenzene	µg/L	0.5	700		22	nd	nd	nd	nd
Glyphosate	µg/L	25	700		14	nd	nd	nd	nd
Heptachlor	µg/L	0.01	.01		21	nd	nd	nd	nd
Heptachlor epoxide	µg/L	0.01	.01		21	nd	nd	nd	nd
Hexachlorobenzene	µg/L	0.05	1		31	nd	nd	nd	nd
Hexachlorocyclopentadiene	µg/L	1	50		22	nd	nd	nd	nd
Lindane	µg/L	0.2	.2		19	nd	nd	nd	nd
Methoxychlor	µg/L	10	40		31	nd	nd	nd	nd
Methyl tert-Butyl Ether (MTBE)	µg/L	3	13	5	22	nd	9.21	nd	nd
Molinate	µg/L	2	20		10	nd	nd	nd	nd
Monochlorobenzene	µg/L	0.5	70		22	nd	nd	nd	nd
o-Dichlorobenzene	µg/L	0.5	600		22	nd	nd	nd	nd
Oxamyl (vydate)	µg/L	20	200		15	nd	nd	nd	nd
Pentachlorophenol	µg/L	0.2	1		16	nd	nd	nd	nd
Picloram	µg/L	1	500		16	nd	nd	nd	nd
Polychlorinated biphenyls (PCBs)	µg/L	0.5	.5		15	nd	nd	nd	nd
Simazine	µg/L	1	4		16	nd	nd	nd	nd
Styrene	µg/L	0.5	100		22	nd	nd	nd	nd
Tetrachloroethylene	µg/L	0.5	5		22	nd	nd	nd	nd

Table 5-4.3
SUMMARY OF RAW WATER QUALITY**
HODGES RESERVOIR @ SURFACE 2001 - 2005

Parameters	Units	DLR*/ MDL	Drinking Water Standards[1]		No. of Samples	Raw Water quality			
			MCL	SMCL		MIN	MAX	MEAN	MEDIAN
Thiobencarb	µg/L		70	1	16	nd	nd	nd	nd
Toluene	µg/L	0.5	150		22	nd	0.557	nd	nd
Total Organic Carbon (TOC)	mg/L	0.5			24	8.11	11.5	10.0	10.0
Toxaphene	µg/L	1	3		19	nd	nd	nd	nd
trans-1,2-Dichloroethylene	µg/L	0.5	10		22	nd	nd	nd	nd
Trichloroethylene	µg/L	0.5	5		22	nd	nd	nd	nd
Trichlorofluoromethane	µg/L	5	150		22	nd	nd	nd	nd
Vinyl chloride	µg/L	0.5	.5		22	nd	nd	nd	nd
Organic Constituents, Unregulated									
Ethyl-t-Butyl Ether (ETBE)	µg/L	0.3			22	nd	nd	nd	nd
t-Amyl-methyl ether (TAME)	µg/L	0.2			22	nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	µg/L	0.5			22	nd	nd	nd	nd
1,1-Dichloropropene	µg/L	0.5			22	nd	nd	nd	nd
1,2,3-Trichlorobenzene	µg/L	0.5			22	nd	nd	nd	nd
1,2,3-Trichloropropane (TCP)	µg/L	0.5			13	nd	nd	nd	nd
1,2,4-Trimethylbenzene	µg/L	0.2			22	nd	nd	nd	nd
1,3,5-Trimethylbenzene	µg/L	0.2			22	nd	nd	nd	nd
1,3-Dichlorobenzene	µg/L	0.5			22	nd	nd	nd	nd
1,3-Dichloropropane	µg/L	0.5			22	nd	nd	nd	nd
2,2-Dichloropropane	µg/L	0.5			21	nd	nd	nd	nd
3-Hydroxycarbofuran	µg/L	3			15	nd	nd	nd	nd
Aldicarb	µg/L	3			14	nd	nd	nd	nd
Aldicarb sulfone	µg/L	4			15	nd	nd	nd	nd
Aldicarb sulfoxide	µg/L	3			15	nd	nd	nd	nd
Aldrin	µg/L	0.075			21	nd	nd	nd	nd
Bromacil	µg/L	10			6	nd	nd	nd	nd
Bromobenzene	µg/L	0.5			22	nd	nd	nd	nd
Bromochloromethane	µg/L	0.5			22	nd	nd	nd	nd
Bromomethane	µg/L	0.5			22	nd	nd	nd	nd
Butachlor	µg/L	0.38			5	nd	nd	nd	nd
Carbaryl	µg/L	5			15	nd	nd	nd	nd
Chlorobenzene	µg/L	0.5			22	nd	nd	nd	nd
Chloroethane	µg/L	0.5			22	nd	nd	nd	nd
Chloromethane	µg/L	0.5			22	nd	nd	nd	nd
Dibromomethane	µg/L	0.5			22	nd	nd	nd	nd
Dicamba	µg/L	15			17	nd	nd	nd	nd
Dichlorodifluoromethane	µg/L	1			22	nd	nd	nd	nd
Dieldrin	µg/L	0.02			20	nd	nd	nd	nd
Hexachlorobutadiene	µg/L	0.5			22	nd	nd	nd	nd
Methomyl	µg/L	2			15	nd	nd	nd	nd
Metolachlor	µg/L	10			6	nd	nd	nd	nd
Metribuzin	µg/L	.5			6	nd	nd	nd	nd
Napthalene	µg/L	0.5			32	nd	nd	nd	nd
n-Butylbenzene	µg/L	0.5			22	nd	nd	nd	nd
n-Propylbenzene	µg/L	0.5			22	nd	nd	nd	nd
Prometryn	µg/L	2			6	nd	nd	nd	nd
Propachlor	µg/L	.1			32	nd	nd	nd	nd
sec-Butylbenzene	µg/L	0.5			22	nd	nd	nd	nd
tert-Butylbenzene	µg/L	0.5			22	nd	nd	nd	nd

Table 5-4.3
SUMMARY OF RAW WATER QUALITY**
HODGES RESERVOIR @ SURFACE 2001 - 2005

Parameters	Units	DLR*/ MDL	Drinking Water Standards[1] MCL	SMCL	No. of Samples	Raw Water quality MIN	MAX	MEAN	MEDIAN

NOTES:

* The State of California DLR values are used when available. Parameters without DLR values were reported ad MDL levels.

** The acceptance criteria in this table apply to finished, potable water, and are for reference only.

(1) State MCL and MCLG values may be more stringent then federal standards for treated water.

(2) Turbidity of treated water is not to exceed 0.3 NTU 95% of the time.

(3) Based on the Langelier Index. A plus quantity indicates non-corrosive tendencies. A negative quantity indicates corrosive tendencies.

(4) No more then 5% of distribution system samples can be total coliform positive

nd: non-detected at State DLR or MDL if DLR not Available

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

This chapter provides a summary of the key conclusions from this survey and recommendations to improve watershed protection and enhance drinking water quality.

Conclusions

Watershed and Water Supply System -

The City owns less then 9% of the land within the watershed. Private and public ownership of the remaining lands is roughly 70% and 30% respectively. Large Native American Indian reservations are contained within the watershed. This ownership pattern limits the control measures the City can implement and focuses watershed control efforts on coordination and communication with agencies.

Most of the watershed lands support rural, agricultural and open space land uses. However, there are urban communities, such as Escondido, Ramona and parts of San Diego. Potential contamination sources include many nonpoint sources which are more difficult to control than point sources.

The terrain is generally mountainous with slopes greater than 25%, creating the likelihood of transport of soils and contaminants to water bodies. The soils have generally high erosion potential. Rainfall ranges from approximately 15 inches annually in the lower watershed, to 25 inches annually in the mountain areas.

Potential Contamination Sources in the Watershed -

Fires were less of an impact on the Hodges watershed than the other watersheds serving the City of San Diego. Heavy rains in 2004 produced heavy inflows into Hodges Reservoir, filling the reservoir to past spill level.

Other potential significant sources of contamination include livestock, sewage, wastewater treatment plants, landfill including Ramona landfill, urban runoff, septic systems, agricultural crops, and fires.

Watershed Management and Control Practices -

The City exercises a number of management practices or controls within the watershed. On City lands, land use and potentially polluting activities are controlled directly. On lands not owned by the City, the primary controls include:

1) Monitoring land use, CEQA compliance activities, water quality permit activities, and other regulatory actions.
2) Coordinating with other agencies to implement appropriate controls.

Additional City resources have been utilized in the past five years to improve City participation and control in both City owned and non-City owned land.

Water Quality Conditions -

Reservoir raw water quality monitoring indicates several constituents may be of concern. The constituents include TDS, turbidity, coliforms, MTBE, nitrogen compounds, and TOC. Water quality in Hodges Reservoir is less desirable than the water in other San Diego reservoirs.

Recommendations

General Recommendations -

Recommendations and corrective actions were developed for the purpose of improving overall watershed protection and drinking water quality. Generally, the recommendations strengthen this first barrier to water quality degradation – protection of source watershed. By strengthening this first barrier, impacts on the second barrier – water treatment – may be reduced.

The recommendations provided are grouped by the following subjects:

- Water Quality Monitoring and Evaluation
- Interjurisdictional Coordination
- Watershed Management and Control Practices
- Public Education
- Water Supply Modifications

Water Quality Monitoring and Evaluation -

During the 2001 – 2005 time period watersheds monitoring was significantly increased. The City should continue monitoring the watersheds. The baseline data for many parameters has been collected.

Additional evaluation of the data should be used to provide guidance on actions necessary to protect the watersheds. As with any monitoring program, the program should be evaluated to help ensure the necessary data is being obtained while conserving laboratory resources.

The monitoring program should place emphasIs on obtaining information necessary to assisting City and non-City forces efforts to protect the watershed. Continued interaction with all interested parties is necessary to continually improve the monitoring program.

Interjurisdictional Coordination -

Lines of communication both within the City and with neighboring agencies have been improved during the 2001 – 2005 time period. However, continued efforts are needed to further the communication and cooperation among agencies. This is of particular importance in the Hodges watershed, due to the use of Hodges Reservoir as a water supply by other water agencies. Specific actions pertaining to Interjurisdictional coordination include the following:

- Expand Workgroups

Workgroups have been established between many of the agencies such as County Planning, U.S. Forest service, Bureau of Land Management. The formation of the workgroups was a positive step. Participation in the workgroups is not consistent among the agencies and the City. Ensuring City forces continue to participation in workgroups is important to coordination between agencies. The City should also determine if additional workgroups will be beneficial.

- Review of New Watershed Land Uses

Land use with the watersheds impacts potential contamination of the water. The City should emphases minimizing potential water quality issues when working with other agencies on watershed land usages.

Watershed Management and Control Practices -

Continue to reduce the impacts from cattle grazing. Impacts can be reduced by elimination of cattle grazing from riparian corridors, prevent cattle access to streams and water bodies, control transport of cattle waste to streams and water bodies, and reduce cattle density.

Public Education -

Public education material has been developed for trail and reservoir usage. Maintaining the educational material in readily available locations will help educate the public to the importance of protecting the watershed. The material should be periodically reviewed to ensure it is accurate and appropriate.

Residents within the watershed have a significant impact on protecting the watershed. Educational programs should emphasize what residents can do

to help protect the watershed and how protecting the watershed provides them great benefits.

Public awareness signage has been installed in several transportation corridors. The signage provides information on actions they can take to help improve water quality. The City should maintain the signage and review it for accuracy and appropriateness.

Water Supply Modifications -

The addition of imported water from San Diego County Water Authority (SDCWA) is being evaluated. SDCWA is determining if a cost effective solution to adding imported water to Hodges exists and if funding can be allocated for the project. Blending of imported water, plus transfer of water from Hodges to Miramar Reservoir, will improve water quality.